

**2nd Edition**

# Energy in the 21st Century



## List of Chapters:

*Preface to the Second Edition*

*Preface to the First Edition*

*About the Authors*

### 1 A Brief History of Energy Consumption

- 1.1 What is Energy?
- 1.2 Historical Energy Consumption
- 1.3 Energy Consumption and the Quality of Life
- 1.4 Energy in Transition
- 1.5 “Decarbonization”
- 1.6 Activities

### 2 Fossil Energy – Coal

- 2.1 Geologic History of the Earth
- 2.2 Origin of Coal
- 2.3 Coal
- 2.4 Distribution and Production of Coal
- 2.5 Fossil Energy and Combustion
- 2.6 Case Study: A Coal-Fired Power Plant
- 2.7 Coal Gas
- 2.8 Activities

### 3 Fossil Energy – Oil and Gas

- 3.1 Geology of Oil and Gas Reservoirs
- 3.2 Origin of Oil and Gas
- 3.3 Oil and Gas Reservoirs and Reserves
- 3.4 Classification of Oil and Gas
- 3.5 Shale Oil, Tar Sands and Extra Heavy Oil
- 3.6 Unconventional Gas
- 3.7 Global Distribution of Oil and Gas
- 3.8 Activities

### 4 Peak Oil

- 4.1 Oil and Gas Production
- 4.2 Global Oil and Gas Production and Consumption
- 4.3 The First Oil Crisis
- 4.4 The Price of Oil

4.5 Hubbert’s Oil Supply Forecast

4.6 Environmental Issues

4.7 Activities

### 5 Nuclear Energy

- 5.1 History of Nuclear Energy
- 5.2 Nuclear Reactors
- 5.3 Global Dependence on Nuclear Power
- 5.4 Nuclear Energy and the Environment
- 5.5 Activities

### 6 Renewable Energy – Solar Energy

- 6.1 Source of Solar Energy
- 6.2 Energy Conversion Efficiency and Intermittency
- 6.3 Passive Solar Energy
- 6.4 Active Solar Energy
- 6.5 Solar Power Plants
- 6.6 Solar Electric Technology
- 6.7 Activities

### 7 Renewable Energy – Wind Energy

- 7.1 History of Wind Power
- 7.2 Wind Turbine
- 7.3 Wind Farms
- 7.4 Case Study: European Wind Power
- 7.5 Can Wind Provide All of Our Energy Needs?
- 7.6 Environmental Impact
- 7.7 Activities

### 8 Renewable Energy – Energy from Water

- 8.1 Hydroelectric Power
- 8.2 Case Study: Three Gorges Dam
- 8.3 Waves and Tides
- 8.4 Geothermal
- 8.5 Activities

### 9 Renewable Energy – Bioenergy and Synfuels

- 9.1 Biomass
- 9.2 Case Study: Biofuels in Brazil
- 9.3 Synfuels

## 2nd Edition

# Energy in the 21st Century

- 9.4 Environmental Impact of Combustible Materials
- 9.5 Activities

### 10 Energy Carrier, Energy Storage and Hybrid Energy Systems

- 10.1 Hydrogen
- 10.2 The Hydrogen Economy
- 10.3 Large Scale Energy Storage
- 10.4 A Hybrid Energy System for the Hydrogen Economy
- 10.5 Activities

### 11 Electricity Generation and Distribution

- 11.1 Historical Development of Electric Power
- 11.2 Electric Power Generation
- 11.3 Transformers
- 11.4 Electric Power Distribution
- 11.5 Developments in Electric Grid Design
- 11.6 Activities

### 12 Energy Economics

- 12.1 Principles of Economics
- 12.2 Costs and Benefits
- 12.3 Economies of Scale
- 12.4 Management Decisions in the Energy Sector
- 12.5 Levelized Energy Cost
- 12.6 Activities

### 13 Future Issues – Geopolitics of Energy

- 13.1 Sustainable Development
- 13.2 Energy and Ethics
- 13.3 Energy and Geopolitics
- 13.4 Global Regulation of Carbon Emissions
- 13.5 Activities

### 14 Future Issues – Energy Forecasts

- 14.1 Nuclear Energy Forecast
- 14.2 Renewable Energy Forecast
- 14.3 Energy Conservation and Energy Forecasts
- 14.4 Energy Mix Forecasts
- 14.5 Forecasts Based on Supply
- 14.6 The Future of Energy
- 14.7 Activities

**Appendix A**

**Appendix B**

**Appendix C**

**References**

**Index**

